**Science, Grade 10, Academic (SNC2D) - SOLUTIONS**

*Chemistry: Chemical Reactions*

*Big Idea: Chemical equations must be balanced to obey the Law of Conservation of Mass*

**Balancing Chemical Equations (Part 2)**

**More Practice Counting Atoms (Subscripts vs Coefficients)**

Recall the following rules for counting atoms in a chemical equation

1. The symbol of an element represents ONE atom of that element

Example(s): Ca = 1 atom of C

Practice: (a) Fe = \_\_\_\_\_\_\_\_1 atom of Fe

(b) B = \_\_\_\_\_\_\_\_1 atom of B

2. A subscript is a number written on the lower right hand corner of the symbol. The subscript indicates the number of atoms for that element.

Example(s): N2 = 2 atoms of N

SO3 = 1 atom S, 3 atoms O

NaClO3 = 1 atom Na, 1 atom Cl, 3 atoms O

Practice: (a) O3 = \_\_\_\_\_\_\_\_ 3 atoms O

(b) CO2 = \_\_\_\_\_\_\_\_ 1 atom C, 2 atoms O

(c) KNO3 = \_\_\_\_\_\_\_\_ 1 atom K, 1 atom N, 3 atoms O

3. A subscript OUTSIDE of a bracket multiplies ALL of the elements inside the bracket

Example(s): Ba3(PO4)3 = 3 atoms of barium, 3 atoms phosphorus, 12 atoms oxygen

Practice: (a) Ca(NO3)2 = \_\_\_\_\_\_\_\_ 1 atom Ca, 2 atoms N, 6 atoms O

(b) Fe2(SO4)3 = \_\_\_\_\_\_\_\_ 2 atoms Fe, 3 atoms S, 12 atoms O

4. A coefficient is a number written IN FRONT of the chemical symbol. It also indicates the number of atoms for that element

Example(s): 2Fe = 2 atoms Fe

3Cl2 = 6 atoms Cl

Practice: (a) 8Na = \_\_\_\_\_\_\_\_ 8 atoms Na

(b) 6Br2 = \_\_\_\_\_\_\_\_ 12 atoms Br

5. A coefficient can also be in front of a chemical formula. This number will multiply the number of atoms for each element in the compound.

Example(s): 2CO2 = 2 atoms C, 4 atoms O

5Fe­2(SO4)3 = 10 atoms Fe, 15 atoms S, 60 atoms O

Practice: (a) 4Cu(NO3)2 = \_\_\_\_\_\_\_\_ 4 atoms Cu, 8 atoms N, 24 atoms O

(b) 2H2O = \_\_\_\_\_\_\_\_ 4 atoms H, 2 atoms O

**More Practice Balancing Chemical Equations**

Balance the chemical equations below. Answer the questions on an extra sheet of paper so that you can show all of your work through use of a chart.

STUDY TIP: Practice naming all of the compounds present in the chemical equation as well.

* + 1. \_\_2\_\_\_ Na + \_\_\_\_\_ Cl2 🡪 \_\_\_2\_\_ NaCl
    2. \_\_2\_\_\_ Na + \_\_\_2\_\_ H2O 🡪 \_\_\_2\_\_ NaOH + \_\_\_\_\_ H2
    3. \_\_2\_\_\_ Mg + \_\_\_\_\_ O2 🡪 \_\_\_2\_\_ MgO
    4. \_\_2\_\_\_ KClO3 🡪 \_\_\_2\_\_ KCl + \_\_3\_\_\_ O2
    5. \_\_2\_\_\_ Al + \_\_3\_\_\_ CuO 🡪 \_\_\_\_\_ Al2O3 + \_\_3\_\_\_ Cu
    6. \_\_\_\_\_ CaCO3 🡪 \_\_\_\_\_ CaO + \_\_\_\_\_ CO2 (already balanced)
    7. \_\_\_\_\_ I2 + \_\_\_2\_\_ Na2S2O3 🡪 \_\_\_2\_\_ NaI + \_\_\_\_\_ Na2S4O6
    8. \_\_6\_\_\_ Mg + \_\_\_\_\_ P4 🡪 \_\_\_2\_\_ Mg3P2
    9. \_\_\_\_\_ AgNO3 + \_\_\_\_\_ KCl 🡪 \_\_\_\_\_ AgCl + \_\_\_\_\_ KNO3 (already balanced)
    10. \_\_2\_\_\_ KI + \_\_\_\_\_ Cl2 🡪 \_\_\_2\_\_ KCl + \_\_\_\_\_ I2
    11. \_\_2\_\_\_ NaHCO3 🡪 \_\_\_\_\_ Na2CO3 + \_\_\_\_\_ H2O + \_\_\_\_\_ CO2
    12. \_\_\_\_\_ BaCl2 + \_\_\_\_\_ Na2SO4 🡪 \_\_\_\_\_ BaSO4 + \_\_2\_\_\_ NaCl

**Helpful tutorial links for balancing equations**

<http://phet.colorado.edu/en/simulation/balancing-chemical-equations> (Online simulations & quizzes)

<http://www.youtube.com/watch?v=YAutl-G7g4A> (Brightstorm)

<http://www.youtube.com/watch?v=RnGu3xO2h74> (Khan academy)

<http://www.webqc.org/balance.php> (Online balancer)